Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – IV • EXAMINATION – WINTER 2012

Subject code: 142501 **Date: 27/12/2012**

Subject Name: Heat Power Engineering

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	[1]Define: (i) Thermal equilibrium (ii) Entropy (iii) Refrigeration	**03**
		[2] Give statements of Kelvin Planck and Clausius for second law of thermodynamics.	**04**
	(b)	Explain Clausius inequality and give third law of thermodynamics.	**07**
Q.2	**(a)**	Derive the expression for change of entropy when m kg of a perfect gas is heated at: (i) constant volume, and (ii) constant pressure.	**07**
	(b)	1 kg of a perfect gas is heated from 80^0C to 315^0C at a constant pressure. It is then cooled at constant volume to the initial temperature of 80^0C. Find the overall change in entropy. Take Cp = 1.005 kJ/kg K and Cv = 0.715 kJ/kg K	**07**
		OR	
	(b)	Derive the general expression for change of entropy of a perfect gas	**07**
Q.3	**(a)**	Explain Carnot cycle and derive equation for its thermal efficiency.	**07**
	(b)	Heat is supplied to a heat engine at the rate of 2500 kJ/min. This engine works on Carnot cycle and gives output of 12 kW. Calculate the rate of heat rejection per second.	**07**
		OR	
Q.3	**(a)**	Explain Diesel cycle and Jule cycle with p-v diagram.	**07**
	(b)	Calculate the thermal efficiency of an engine working on Otto cycle. The bore and stroke of the cylinder are 18 cm and 30 cm respectively. The clearance volume is 0.002022 m^3. Take Y=1.4	**07**
Q.4	**(a)**	What is steam turbine? Explain principle of operation of impulse and reaction turbine.	**07**
	(b)	Why compounding of steam turbine is required? List various methods of compounding and explain any one with neat sketch.	**07**
		OR	
Q.4	**(a)**	Classify gas turbines. Explain the working of constant pressure closed cycle gas turbine with neat sketch.	**07**
Q.4	**(b)**	List methods of improving thermal efficiency of open cycle gas turbine and explain any one with neat sketch.	**07**
Q.5	**(a)**	Why multi stage compression is required in compressor? Explain working of two stage reciprocating compressor with inter cooling with neat sketch.	**07**
	(b)	Briefly explain reversed Carnot cycle and Bell Coleman cycle with p-v diagram.	**07**
		OR	
Q.5	**(a)**	Draw flow diagram for vapour compression refrigeration cycle and briefly explain function of each component of cycle.	**07**
	(b)	[1] Write a short note on black body.	**03**
		[2] Briefly explain: (i) Conduction (ii) Air conditioning	**04**

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